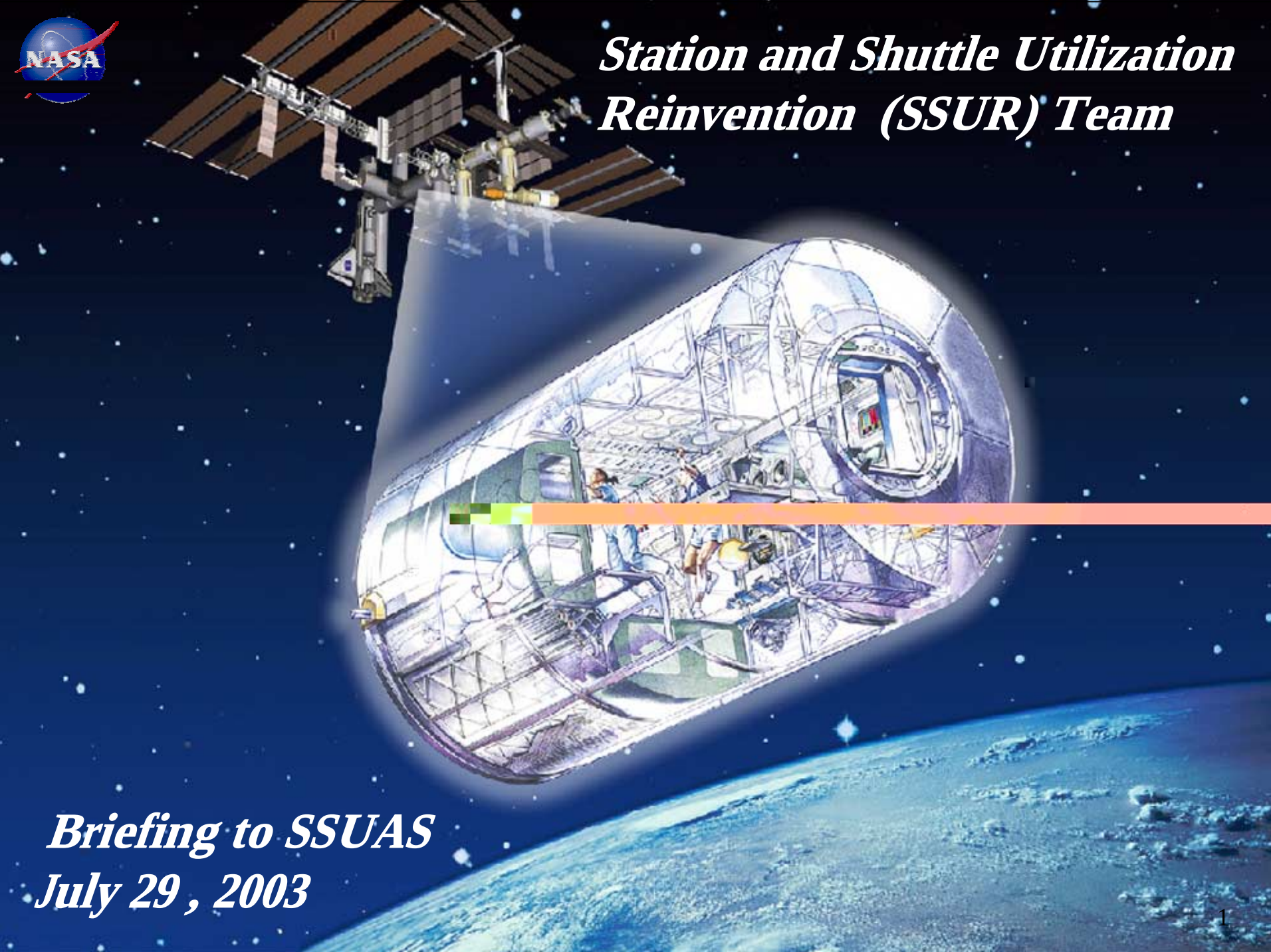


Station and Shuttle Utilization Reinvention (SSUR) Team

Briefing to SSUAS
July 29 , 2003

Why was the Station and Shuttle Utilization Reinvention Team Chartered?

- The Agency recognizes that the Shuttle and Station end-to-end process needed to be reinvented in order for NASA to meet the expectations of the external research/ user community.

SSUR Team Members

The team is comprised of an internal and external subteam

Internal Subteam

Rita Willcoxon *(Lead)* - KSC
Mary Sharpe - (Technical Asst.) - KSC
Michele Brekke - JSC
Todd Corey- KSC
Dr. Gary Jahns - ARC
Barbara Kreykenbohm - HQ-UM
Dr. Feng Liu – JPL
Stan Nichols - HQ-OSF
Ron Porter- MSFC
Lesa Roe – JSC
Russell Romanella - KSC
Dawn Schaible - KSC
Tom St. Onge - GRC
Teresa Vanhooser – MSFC

External Subteam

Dr. Dan Mulville, Lead
John Conway
Joe Cremin
Dr. Chuck Fuller
Dr. Al Sacco
Richard Swalin

Ex-Officio Members

Eve Lyon - HQ Legal
Dave Beck - HQ Procurement

SSUR Team Charter

The team will identify and prioritize the areas within ISS and Shuttle end-to-end utilization process most needing change to improve research/user community satisfaction and productivity across all Enterprises. Where appropriate propose change strategies that will:

1. Optimize Agency high priority research throughput

2. Strengthen NASA's emphasis on the research/user community to enable world-class research environment in space

3. Enable ISS institute success

4. Remove impediments to the utilization process

SSUR Team Process

Jan 13 – March 14

Establish charter with problem statement and set of goals

- *Charter*
- *Glossary of Terms*

Jan. 13 – April 25

Gather data around the goals and problem statement

- *Customer Feedback*
- *Integrated past study review*
- *Current process (product flow, interfaces, cycle time)*
- *Ongoing improvement initiatives*
- *Focus Groups at Centers & HQ*
- *Payload Significant Anomaly data*

Feb 11 – June 6

Analyze data and identify major problem areas

- *Analysis of current process (product flow, interfaces, cycle time, PERT/Critical Path)*
- *Assess on-going initiatives*
- **Root Cause assessment of past studies recommendations**
- *Metrics assessment*
- *Drill down of impediments*
- *Identify major problem areas*
- *Red Team I*

May 6 – June 19

Generate ideas to solve the problems

- **Customer view of current vs. desired state (PERT flow)**
- *Brainstorming in subgroups*
- *Benchmark of other areas*
- *Focus Groups at Centers*
- *Formulate Change Strategies*
- *Senior Management Feedback*

June 16 – July 29

Evaluate & refine ideas selected, then develop recommendations

- **Develop recommendation evaluation criteria**
- **Team consensus on prioritized recommendations**
- *Develop recommendation package*
- *Integrate with Institute SOW*
- **Red Team II**

Aug. 5 – Aug 21

Present recommendations to management

- **Reviews with**
  - **Shuttle, ISS Program**
  - **Process Owners**
  - **Center Directors**
  - **AA's**
- **Presentation to Enterprise Council**

Aug. 5 – Sept.1

Develop action plan & final report

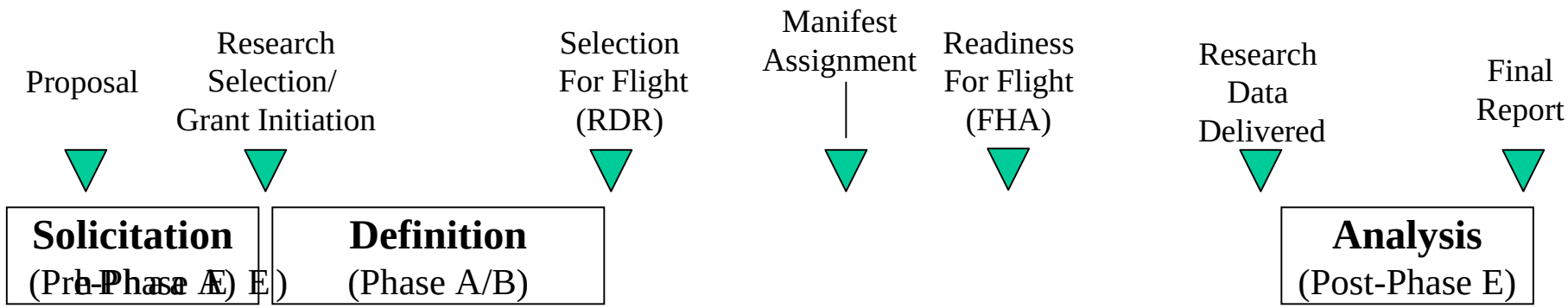
- **Action plan including schedule, monitoring of progress and metrics/ incentives**
- **Final Report**

Bold – Tasks remaining
Italics – Tasks complete

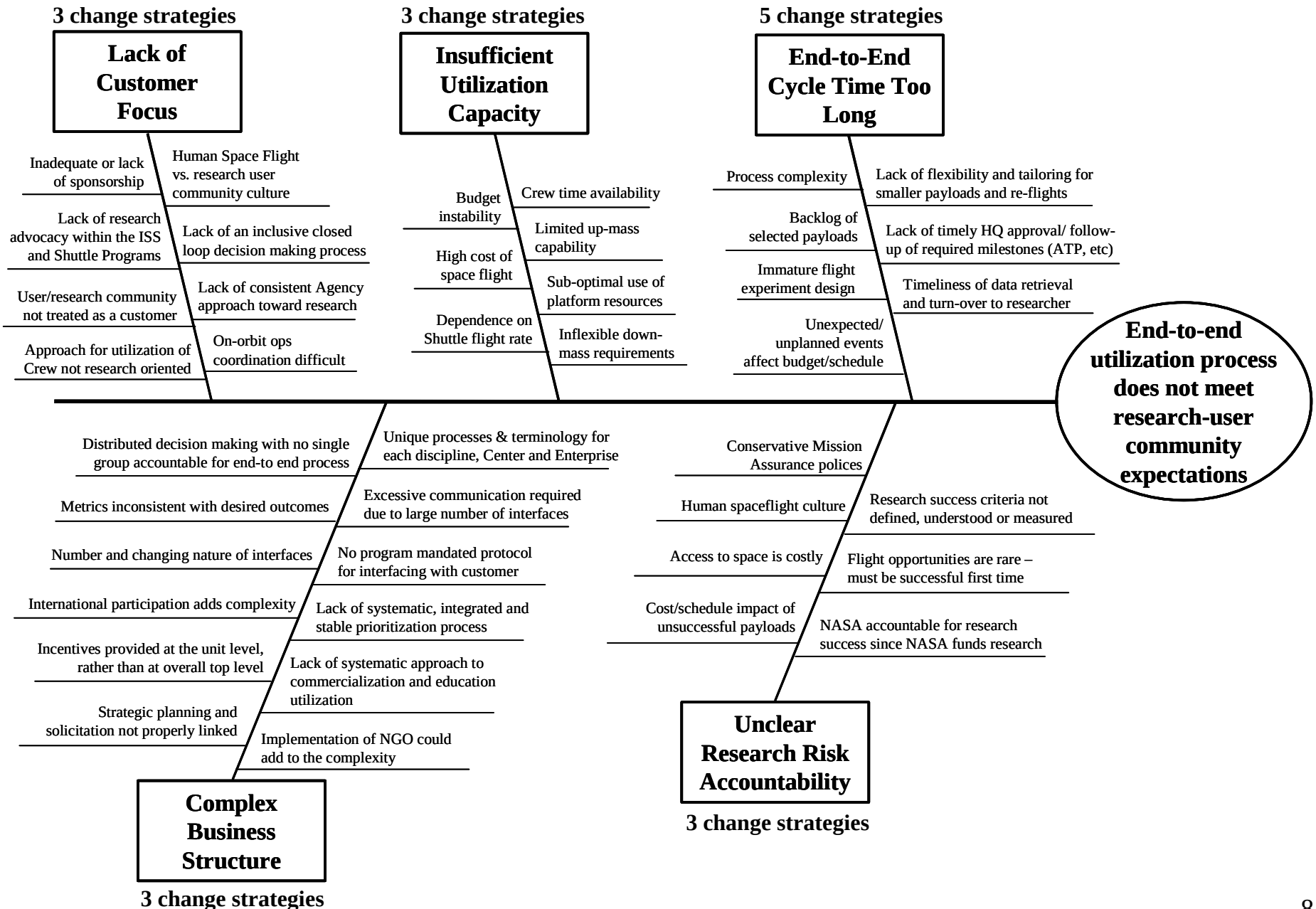
SSUR Problem Identification Process

- Documented the current process
  - End-to-end flow analysis (PERT)
  - Collected cycle time data on past and current payloads to baseline as a comparison to cycle time goal
  - Interface Analysis
  - Product Flow

- Used all the data to perform a cause and effect fishbone analysis of the end-to-end process
  - Identified 5 major problem areas
    - Identified the major impediments under each problem area


Proposal
Research Selection/ Grant Initiation
Selection For Flight (RDR)
Manifest Assignment
Readiness For Flight (FHA)
Research Data Delivered
Final Report
Solicitation (Pre-Phase A)
Definition (Phase A/B)
Analysis (Post-Phase E)

Integrated Cause and Effect Fishbone



Primary Change Categories

Research Throughput

Insufficient Utilization Capacity

1. Increase Budget Stability
2. Alternate/Supplemental Space Access Capability

Complex Business Structure

3. Unified Station and Shuttle Utilization Process

End-To-End Cycle Time Too Long

4. Maturity of Proposals

Unclear Research Risk Accountability

5. Payload Classification System

End-To-End Cycle Time Too Long

6. Timeline Tailored to Experiment
7. Manifest Optimization
8. Reduced Process Complexity
9. Concurrent Payload Development and Integration
10. Center-to-Center Reciprocity

Emphasis on the Research/User Community

Unclear Research Risk Accountability

11. Agency Research Success Philosophy
12. Principal Investigator Decision Maker for Research

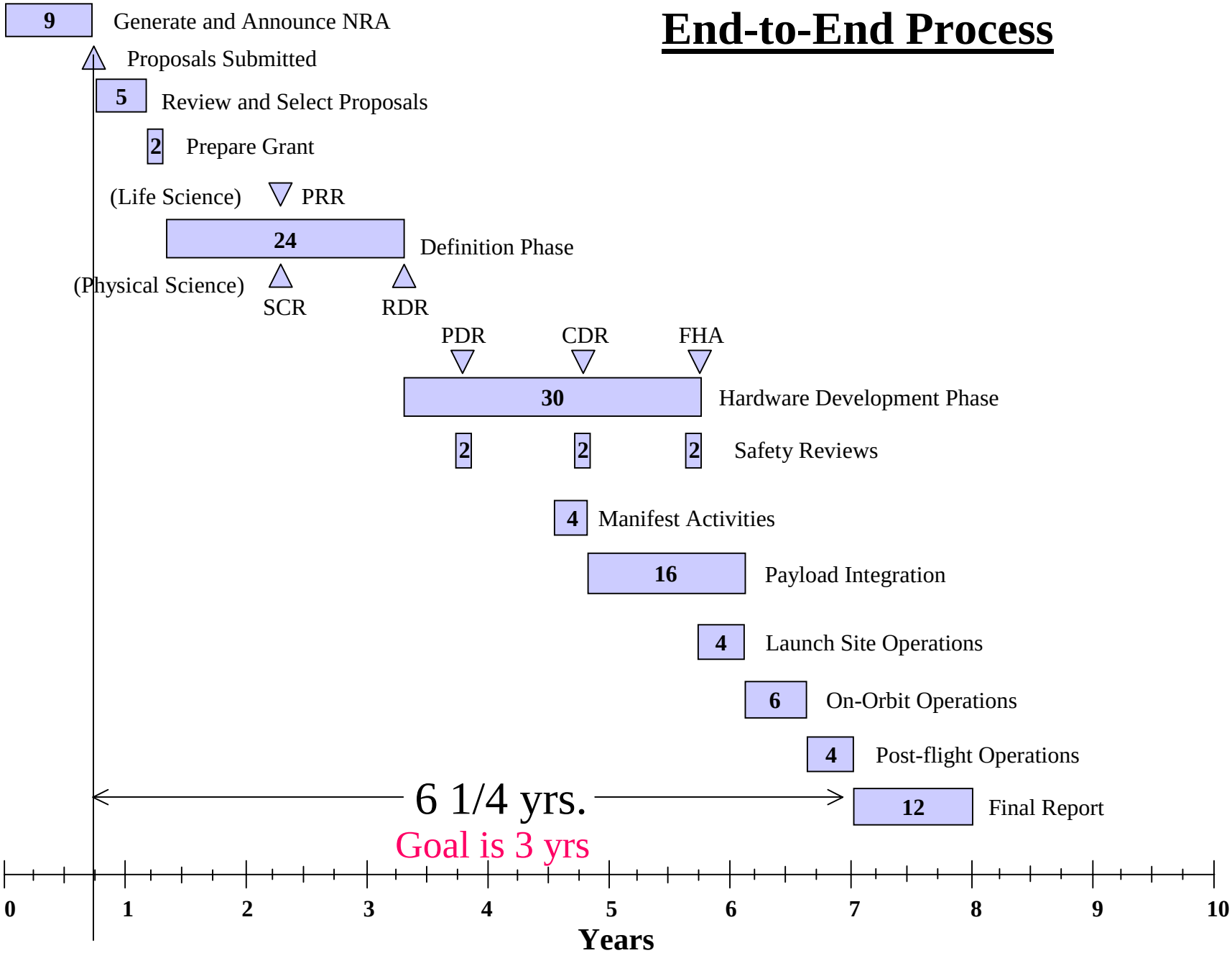
Lack of Customer Focus

13. Transform Agency Culture
14. Improve Research Advocacy
15. More Customer Focused Interfaces

Complex Business Structure

3. Unified Station and Shuttle Utilization Process
16. Integrate Utilization at JSC
17. Agency Approach to Commercial Use

End-to-End Process



Research Throughput
Strategy 1: Increase Budget Stability

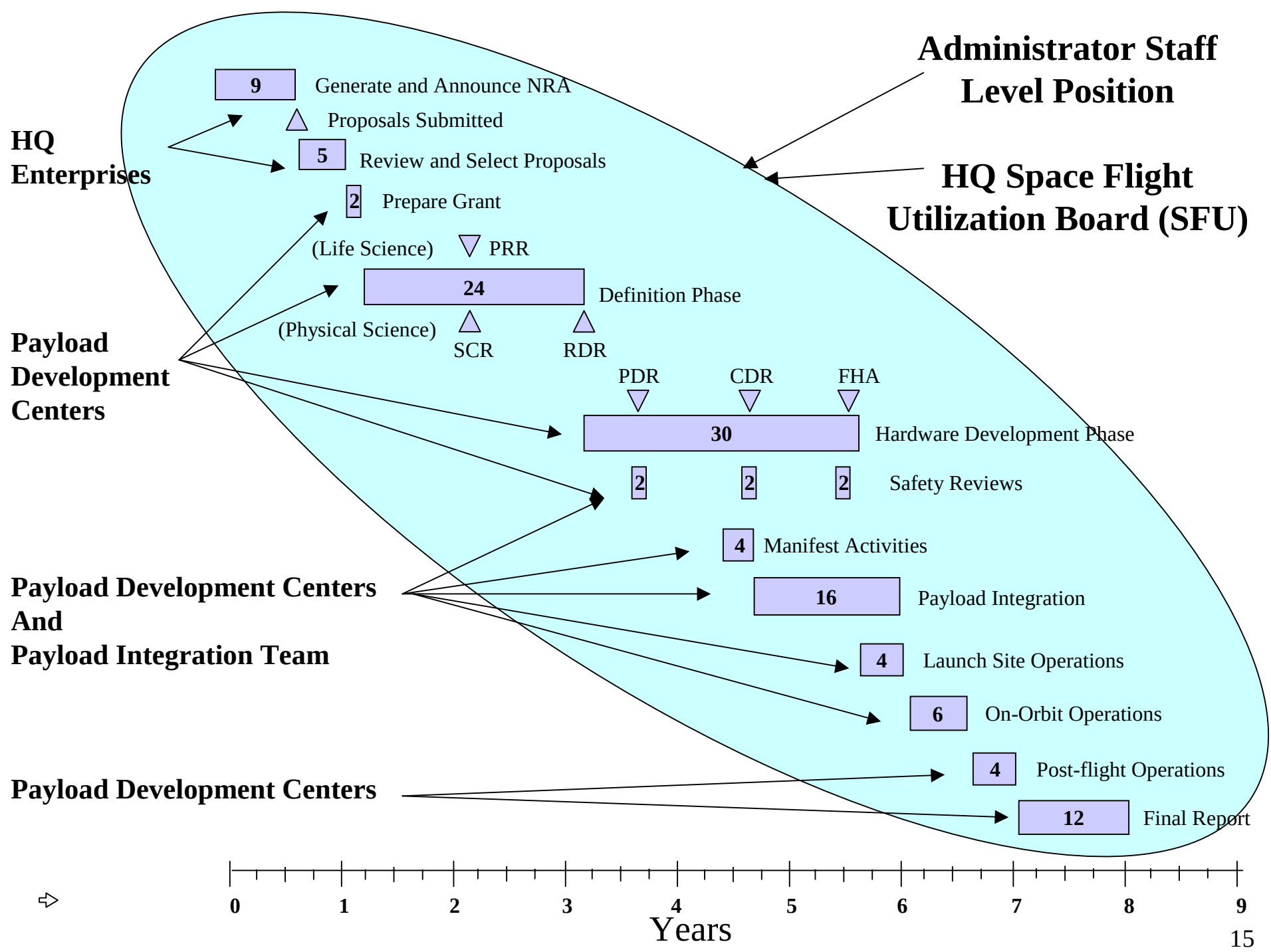
- Develop and implement an initiative, starting at the top of the Agency, to increase budget stability at all levels. Candidate areas include:
  - Work with Congress to allocate multi-year budgets for NASA and assure that earmarks are accompanied by additional funding

Research Throughput
Strategy 2: Alternate/Supplemental Space Access

- Assure space access and earth return capability that is robust enough to accommodate the requirements of the research/user community during nominal times and though significant stand-downs
- Work with the ongoing NASA Integrated Space Transportation Plan (ISTP) study team to assure implementation
  - Establish a practice that decisions about transportation system architecture and design will routinely be based on research user requirements as well as NASA mission needs
  - Ensure that the ISTP includes provisions for adequate crew to conduct ISS research including, as a minimum, dedicated on-orbit crew hours to support requirements defined by the international User Operations Panel (UOP)
  - Assess the value of providing ELV cargo delivery to the ISS thus providing alternate/supplemental space access without additional human space flight
    - Reassess downmass requirements
    - Evaluate concepts for developing a cargo return capability for an ELV cargo system
    - Conduct a cost-benefit trade of these two approaches

Research Throughput
Strategy 3: Unified Station and Shuttle Utilization Process

- Implement a single unified (One NASA) Station and Shuttle utilization process across the agency where requirements and resources are integrated through an agency level strategic plan with allocations and priorities
  - Establish an Administrator staff level position to elevate and focus Station and Shuttle Utilization to the highest level within NASA
  - Establish a HQ Space Flight Utilization Board (SFUB) with appropriate membership (Enterprise Codes U, S, Y, M, N, R, etc..) chaired by the new position at Administrator's level
  - Establish integrated Station and Shuttle utilization priorities


Administrator Staff Level Position
HQ Space Flight Utilization Board (SFU)
HQ Enterprises
9
Generate and Announce NRA
Proposals Submitted
5
Review and Select Proposals
2
Prepare Grant
(Life Science)
PRR
24
Definition Phase
(Physical Science)
SCR
RDR
Payload Development Centers
PDR
CDR
FHA
30
Hardware Development Phase
2
2
2
Safety Reviews
4
Manifest Activities
Payload Development Centers And Payload Integration Team
16
Payload Integration
4
Launch Site Operations
6
On-Orbit Operations
Payload Development Centers
4
Post-flight Operations
12
Final Report
0
1
2
3
4
5
6
7
8
9
Years

Research Throughput
Strategy 4: Maturity of Proposals

- Investigation Proposals that are solicited and selected by NASA for flight should be of sufficient maturity to allow for predictable progress to flight

- Selections should be made only if a realistic flight opportunity window can be identified without over-subscription of resources

- Where unique hardware needs to be developed, options within the NRA process should enable the proposer to partner with other scientists and/or a Payload Developer to facilitate mature proposals that include hardware development concept and cost estimate

- Reduce the number of peer reviews to proposal peer review only

Research Throughput
Strategy 5: Payload Classification System

- Develop Agency wide research risk classification system and methodology that clearly defines categories of acceptable levels of risk for research independent of safety
  - Include definitions of risk areas, experimental design, experiment operations, documentation and performance verification, supporting hardware reliability
  - Provide guidelines for categorization of different payload classes
  - Recommended levels of acceptable risk should be based upon factors including; total cost, Station/Shuttle resources, reflight and criticality to agency strategic goals

	Class A	Class B	Class C	Class D
Characterization	High Priority, Minimum risk	High priority, medium risk	Medium priority, medium/high risk	High risk, minimum cost
National Prestige	High	High	Moderate	Low
Complexity	High	High to Medium	Medium to Low	Low
Hardware Life	Long, >5years	Medium, 5 years	Short, <2 years	Short << 2 years
Cost	High	High to medium	Medium	Low
Launch Constraints	Critical	Moderate	Few	Few to none
In-Flight Maintenance	Not feasible	Not feasible or difficult	May be feasible	May be feasible

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Research Throughput
Strategy 6: Timelines Tailored to Experiment

- Create customized process plans and schedules according to the needs of each investigation
  - Initial proposals will be tailored by mutual agreement during definition phase
  - Individual process plan variations will address, but not be limited to, documentation requirements, number of reviews, speed of development, risk management and other appropriate characteristics

Research Throughput
Strategy 7: Manifest Optimization

- Investigate methodologies for empowering the Principal Investigator in the manifest optimization process. Assessment of a concept incorporating an end user (PI) bidding for resources opportunities

  - Upon establishment of a user complement for a particular increment and their respective priorities, allow end users to negotiate resources. Users “own” clearly defined resources and exchange resources among themselves to enhance their respective investigations

  - Requires “Mature Proposals” and “Timelines Tailored to Experiment” Change Strategies to be implemented and reasonably stable resources. Bidding process to begin after research prioritization

  - Benefits assessment with current simple ranking vs. this market-based approach would need to be assessed

Research Throughput
Strategy 8: Reduced Process Complexity

- Endorse the current ISS Payloads Office process improvement activity that addresses timing of deliverables, excessive requirements in the integration phase of the cycle, and data deliverables

- Extend the process improvement to the front part of the end-to-end process (proposal selection through payload hardware development)

- Establish a team comprised of Research Integration Offices, HQ Program Executives, and a representative from the ISS Payloads Office

  – Perform an assessment of the data requirements on a Payload Developer/Payload Investigator for the upfront phases of the process

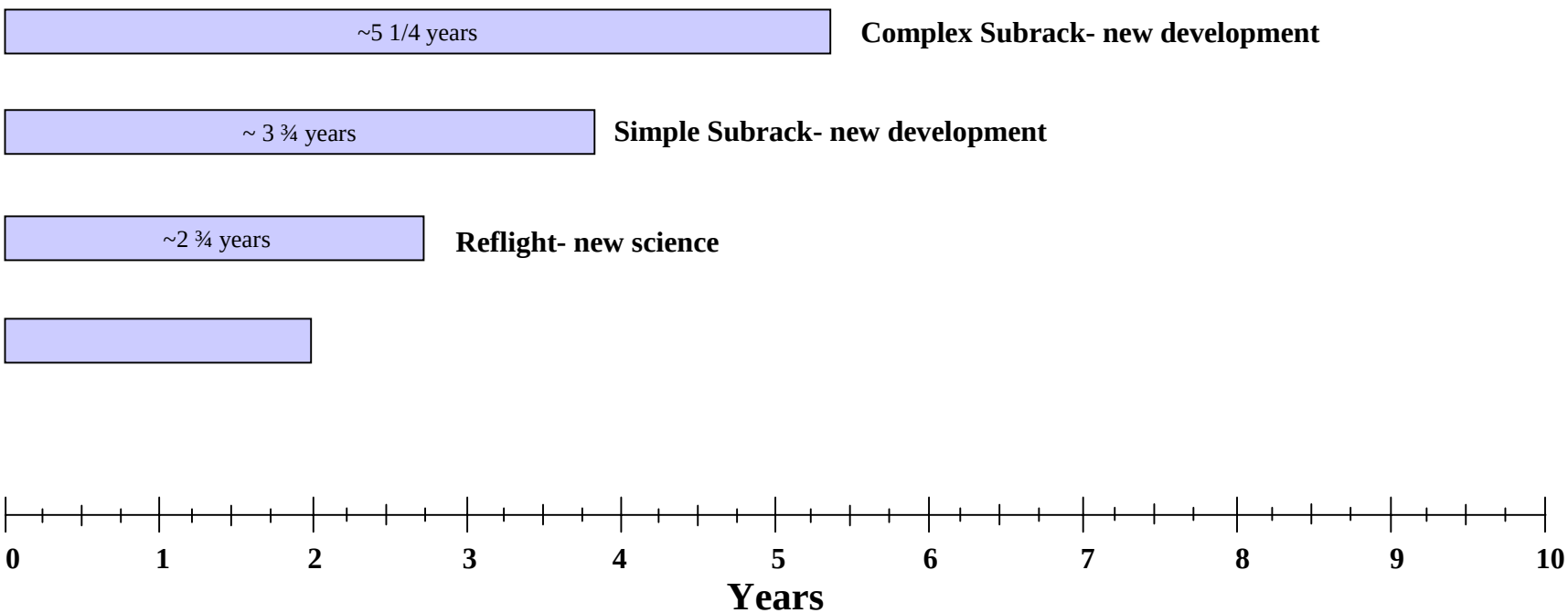
  – Share best practices for streamlining and eliminating requirements and processes that impact the Payload Developer and Principal Investigator

Research Throughput
Strategy 9: Concurrent Payload Development and Integration

- Conduct a pilot program to determine the feasibility of using concurrent engineering to define, design, develop, and perform integration in a more parallel fashion.
  - Based on existing NASA Design Center models (e.g. JPL, GSFC)
  - Team will consist of: Principal Investigator, Payload Development Team, operations, engineering and Payload Integration Manager

Research Throughput
Strategy 10: Center-to-Center Reciprocity

- Develop policies and procedures (e.g. Inter-Center Agreements and Memorandums of Agreement) that allow any given NASA Center, or Research Partnership Center, to accept the analysis, technical specifications, review results and certifications of another Center


~5 1/4 years
Complex Subrack- new development
~ 3 ¾ years
Simple Subrack- new development
~2 ¾ years
Reflight- new science
0
1
2
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5
6
7
8
9
10
Years

Benefits of Research Throughput Change Strategies

- Reduce time-to-flight
- Reduce User Workload and Cost
- Principal Investigators partnership in manifesting, rapid assessments of changes with potential for more flight opportunities
- Involve users in process, providing more control to PI/PD
- Elevate research priority, provide utilization advocacy within the Agency at the highest level, and oversee PI's interest in the end-to-end utilization process
- Increase the opportunities by providing supplemental access to space
- Assure Agency's highest priority research will be flown
- Through the classification process PI/PD's will be brought into the process and allowed to take as much control as the classification allows in developing their hardware, software and experimental protocols
- Reduce process complexity, cost and time-to-flight by removing the requirement to re-validate or re-verify work previously preformed by another Center

Primary Change Categories

Research Throughput

Insufficient Utilization Capacity

1. Increase Budget Stability
2. Alternate/Supplemental Space Access Capability

Complex Business Structure

3. Unified Station and Shuttle Utilization Process

End-To-End Cycle Time Too Long

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Emphasis on the Research/User Community

Unclear Research Risk Accountability

11. Agency Research Success Philosophy
12. Principal Investigator Decision Maker for Research

Lack of Customer Focus

13. Transform Agency Culture
14. Improve Research Advocacy
15. More Customer Focused Interfaces

Complex Business Structure

3. Unified Station and Shuttle Utilization Process (presented earlier)
16. Integrate Utilization at JSC
17. Agency Approach to Commercial Use

Emphasis on the Research/User Community
Strategy 11: Agency Research Success Philosophy

- NASA needs to change the Agency's definition of research success to experimental results that lead to, or which truly change the way humanity lives, works and explores.

- NASA needs to look at research both of a fundamental and applied nature that addresses the needs, present and future, of its constituency.

- It is important that the NASA workforce recognize that an experiment's success has multiple components and no single measurement is adequate. This will require NASA to use the criteria the rest of the scientific community uses in their respective disciplines such as peer reviewed results and patents a measure of mission research success.

Emphasis on the Research/User Community
Strategy 12: Principal Investigator Decision Maker for Research

- Build flexibility into the system for the Principal Investigator to change and mature the research ideas, objectives, and direction throughout the end-to-end process.
  - Facilitate updates and adjustments to research requirements and focus from payload selection to payload delivery to the launch site to the maximum extent available resources will allow
  - Enable flexibility for Principal Investigator to make changes in research direction and associated decisions regarding research based upon results to date and resources available during on-orbit operations

Emphasis on the Research/User Community
Strategy 13: Transform Agency Culture

- Transform the Agency Culture to increase focus and priority on the customer – and partner with the research/user community in accomplishing the Agency's vision for world-class space research on the ISS and Shuttle platforms.
  - Place added emphasis on Research User Community in Agency high level plans, Mission Statements, Performance Plans of Senior Managers (Agency, Center, and Program), Agency and Center metrics, and Agency priorities including budget
  - Provide significant awards and incentives with input from the research customer to employees who provide outstanding customer support together with Principal Investigator and Graduate Student Investigator for significant research accomplishments
  - Improve crewmember access and research support capability (training time and interface with researchers, crew rotational assignments in research areas, on-orbit communications, researchers in flight crew)

Emphasis on the Research/User Community
Strategy 14: Improve Research Advocacy

- Significantly increase available resources at NASA Headquarters and the Field Centers to incorporate marketing and other professional skills, and better utilize and train NASA's 'advocacy corps' to promote space based research

- Better communicate the relevance of research on ISS and highlight significant research achievements and spin-offs throughout NASA, the research community, and the general public

- Specific initiatives include: increased budget authority, obtaining outside expertise to implement advocacy campaign, pre and post mission presentations, educating NASA employees on research importance

Emphasis on the Research/User Community
Strategy 15: More Customer Focused Interfaces

- Provide a structured Agency entry point for all potential research utilization customers regardless of platform, including:
  - identifying the appropriate sponsor
  - customer help desk
  - comprehensive website support.

- Identify a specific Research Integration Office (RIO) (or equivalent) for all disciplines that will be accountable to the PI throughout the end-to-end research process
  - RIO delegated accountability from the Research Sponsor.
  - RIO assigns a primary interface (with input from the PI) together with a Payload Developer (PD) for the investigation.
  - A dedicated (thru mission life) Payload Integration Team with representatives from each supporting NASA Center with representatives including the PD, JSC Payload Integration Manager (PIM), MSFC Payload Ops Representative, and KSC Launch Services Representative.

Emphasis on the Research/User Community
Strategy 16: Integrate Utilization at JSC

- Integrate Station and Shuttle utilization activities at JSC into a single Program. Establish a phased approach where utilization responsibilities are first consolidated within the Station Program with eventual transition to a single Utilization Program

- The Program would be a single interface and focus for the research/user community to both Station and Shuttle research platforms resulting in a strong research/user community advocate

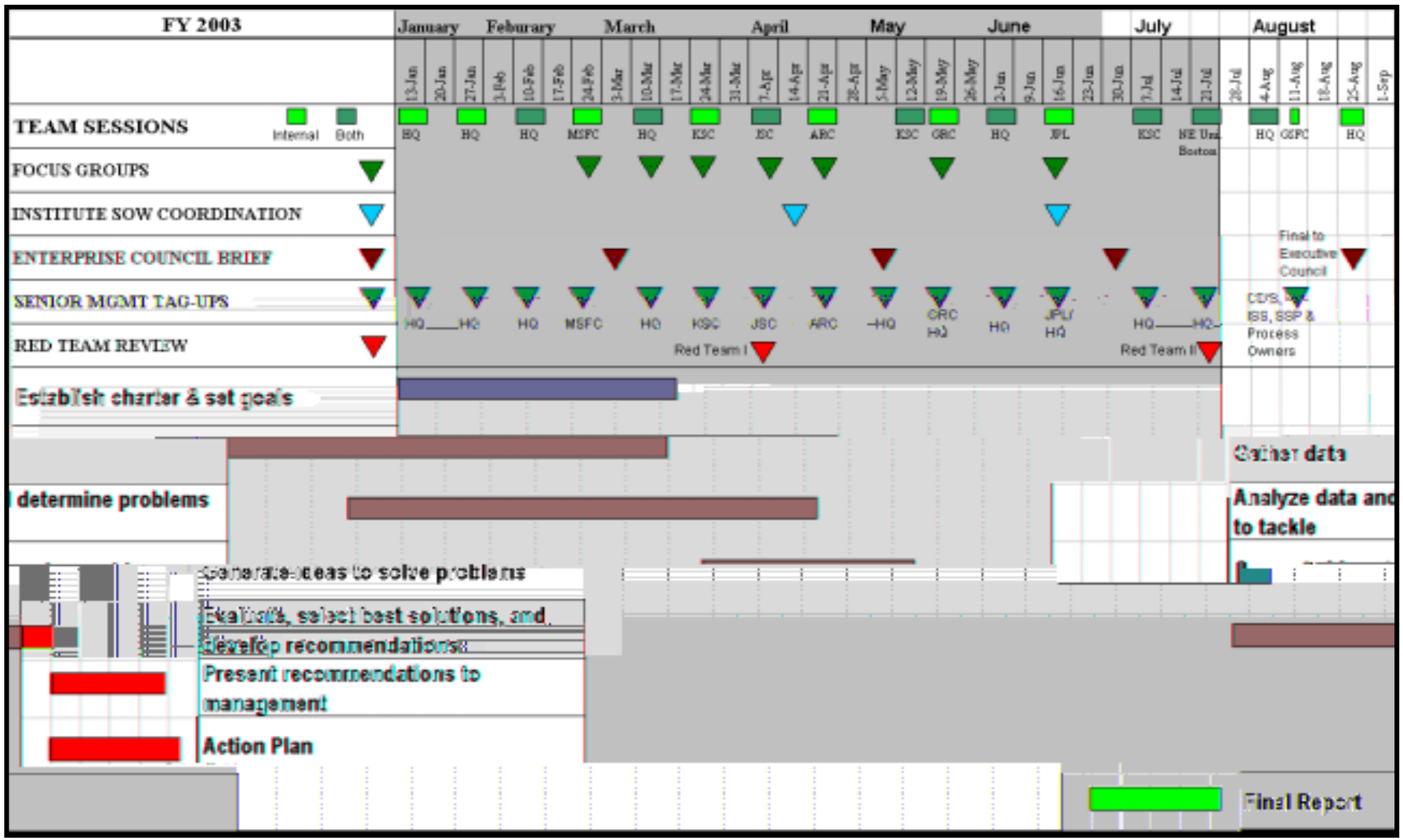
- The Program would acquire services from Shuttle and Station Programs or future launch service vehicles/providers and maximize utilization capabilities across platforms

Emphasis on the Research/User Community
Strategy 17: Agency Approach to Commercial Use

- Integrate the Agency's approach toward partnerships with commercial organizations that use the Shuttle and Station
- Provide a single HQ focus to assess and approve commercial utilization efforts that directly contribute to the Agency mission
- Relationship between sponsoring Enterprises and Research Partnership Centers (RPC) would not be changed. Enterprises will be responsible for assuring the RPC activities are aligned with the overall Agency mission

- Reinforce the researcher as the primary customer within Human Space Flight
- Since the PI will be the primary decision maker on his or her experiment they will be more involved controlling all research related questions and trade-offs. This will allow serendipity, often the mother of innovation and discovery
- Provide incentives for improved customer satisfaction
- Simplify and improve interfaces between the researcher user and NASA, including the flight crew
- Elevate research priority and importance to Agency and provide a single program manager who's sole focus is Utilization
- Provide the resources and capabilities necessary to achieve advocacy
- Elevate Research Utilization to be of equal importance to the Station and Shuttle Vehicle operations and engineering
- Integrate and coordinate all agency activities regarding commercial partnerships using

SSUR Team Schedule



Summary

- The Agency is serious about making changes that will improve the end to end process and better meeting research/user community expectations.

- Our SSUR Team has taken specific measures to ensure recommendations are implemented this time
  - Recommended Change Strategies approved by the Executive Council which is chaired by the Deputy Administrator
  - Process Owners will be identified with each change and will be required to report back to Executive Council on a regular basis until the strategy is implemented
  - Budget has been set aside to implement the changes

Backup

Acronyms

AO	Announcement Opportunity
ARC	Ames Research Center
BPRAC	Biological & Physical Research Advisory Committee
CD	Compact Disk
CDR	Critical Design Review
ELV	Expendable Launch Vehicle
EXPRESS	Expediting the Process of Experiments to Space Station
FAWG	Flight Assignment Working Group
FHA	Flight Hardware Acceptance
FY	Fiscal Year
GAS	Get-Away Special
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
HQ	Headquarters
I/F	Interface

Acronyms

ISS	International Space Station
ISTP	Integrated Space Transportation Plan
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KSC	Kennedy Space Center
OSF	Office of Space Flight
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NPG	NASA Policy Guidelines
NRA	NASA Research Announcement
PAO	Public Affairs Office
PD	Payload Developer
PDC	Payload Development Center
PDR	Preliminary Design Review
PERT	Program Evaluation & Review Technique
PI	Principal Investigator

Acronyms

PIM	Payload Integration Manager
PIT	Payload Integration Team
POCAAS	Payload Operations Concept Architecture Assessment Study
RIO	Research Integration Office
RPC	Research Partnership Center
SFUB	Space Flight Utilization Board
SSCB	Space Station Control Board
SSP	Space Shuttle Program
SSUB	Space Station Utilization Board
SSUR	Station and Shuttle Utilization Reinvention
STS	Space Transportation System
UOTAT	Utilization, Operations, and Training Assessment Team
UOP	User Operations Panel

Integrated Feedback List

- An integrated comments spreadsheet has been developed that contains 360 feedback suggestions on the end-to-end utilization process
- These comments have been collected from numerous feedback forums:
  - Payload Operations Concept Architecture Assessment Study (POCAAS)
  - Payload Engineering Processing Study Phase A, (Nygren & Havens)
  - Cocoa Beach User Workshop - 2002
  - Salzman Findings (KSC customer feedback data, Howard Ross PI interview data, Cocoa Beach User Conference)
  - Freedom to Manage
  - JSC ISS Survey Data (ISS Program needs assessment, post increment customer survey)
  - Space Station Freedom Continuous Improvement Customer Support Team
  - KSC Customer Survey 2001, 2002
  - Shuttle Payload Office Customer Feedback/ Freedom to Manage
  - Internal - these comments have been generated during the SSUR internal focus groups since January 2003

Integrated Past Study Review

- An integrated past studies spreadsheet has been developed that contains 184 recommendations on the end-to-end utilization process
- These comments have been collected from numerous feedback forums:
  - Freedom to Manage, 2002
  - Payload Operations Concept Architecture Assessment Study, 2001-2002
  - Biological & Physical Research Advisory Committee (BPRAC) Recommendations, 2000-2002
  - NRC -Factors Affecting the Utilization of the International Space Station for Research in the Biological and Physical Sciences Space Station Utilization Advisory Subcommittee, 1996-2002
  - National Research Council - Pings Study, 1999-2000
  - ISS Operations Architecture Study, 1999-2000
  - Microgravity Research Program Study, 1999
  - Payload Engineering Processing Study Phase A & B, 1997
  - Utilization, Operations, and Training Assessment Team (UOTAT), 1995
  - Space Station Freedom Continuous Improvement Customer Support Team, 1991

- Targeted people involved in the process and solicited their input on what areas of the end-to-end process most needing improvement
  - –

Research Throughput
Strategy 1: Increase Budget Stability

Description of Change Strategy:

- Develop and implement an initiative, starting at the top of the Agency, to increase budget stability at all levels. Candidate areas include:
  - Work with Congress to allocate multi-year budgets for NASA.
  - Work with Congress to assure that earmarks are accompanied by funding that is an addition to the Agency budget.
  - Establish a better overall process for grant management.
    - Establish rules and procedures to allow full costing of grants at time of award
    - Fully fund selected research proposals – after adjusting for any changes recommended during the peer review cost analysis process.
    - Establish a policy that research grant funding will not be reduced once the grant is awarded, with exceptions for lack of performance or significant change in Enterprise priorities.
  - Mitigate impacts of new Agency policies and procedures, such as NPG 7120.5 "NASA Program and Project Management Processes and Requirements" and ISO 9000 by providing funding for the changes or exempting existing projects.

Benefits to Customer:

- Reduce Time to Flight by eliminating project delays due to budget changes
- Increase the Opportunities for Flight by providing stable funding, on schedule, to enable timely payload development

Research Throughput
Change Strategy 2: Alternate/Supplemental Space Access

Description of Change Strategy:

- Assure space access and earth return capability that is robust enough to accommodate the requirements of the research/user community during nominal times and though significant stand-downs. Work with the ongoing NASA Integrated Space Transportation Plan (ISTP) study team to assure implementation.
  - – Establish a practice that decisions about transportation system architecture and design will routinely be based on research user requirements as well as NASA mission needs.
  - –Ensure that the ISTP includes provisions for adequate crew to conduct ISS research including, as a minimum, dedicated on-orbit crew hours to support requirements defined by the international User Operations Panel (UOP)
  - –Develop information to assess the value of providing ELV cargo delivery to the ISS thus providing alternate/supplemental space access without additional human space flight
    - Reassess downmass requirements
    - Evaluate concepts for developing a cargo return capability for an ELV cargo system.
    - Conduct a cost-benefit trade of these two approaches

Benefits to Customer:

- Reduce Time to Flight by providing alternate access to space in case of extended stand-down
- Increase the Opportunities by providing supplemental access to space

Research Throughput
Change Strategy 3: Unified Station and Shuttle Utilization Process

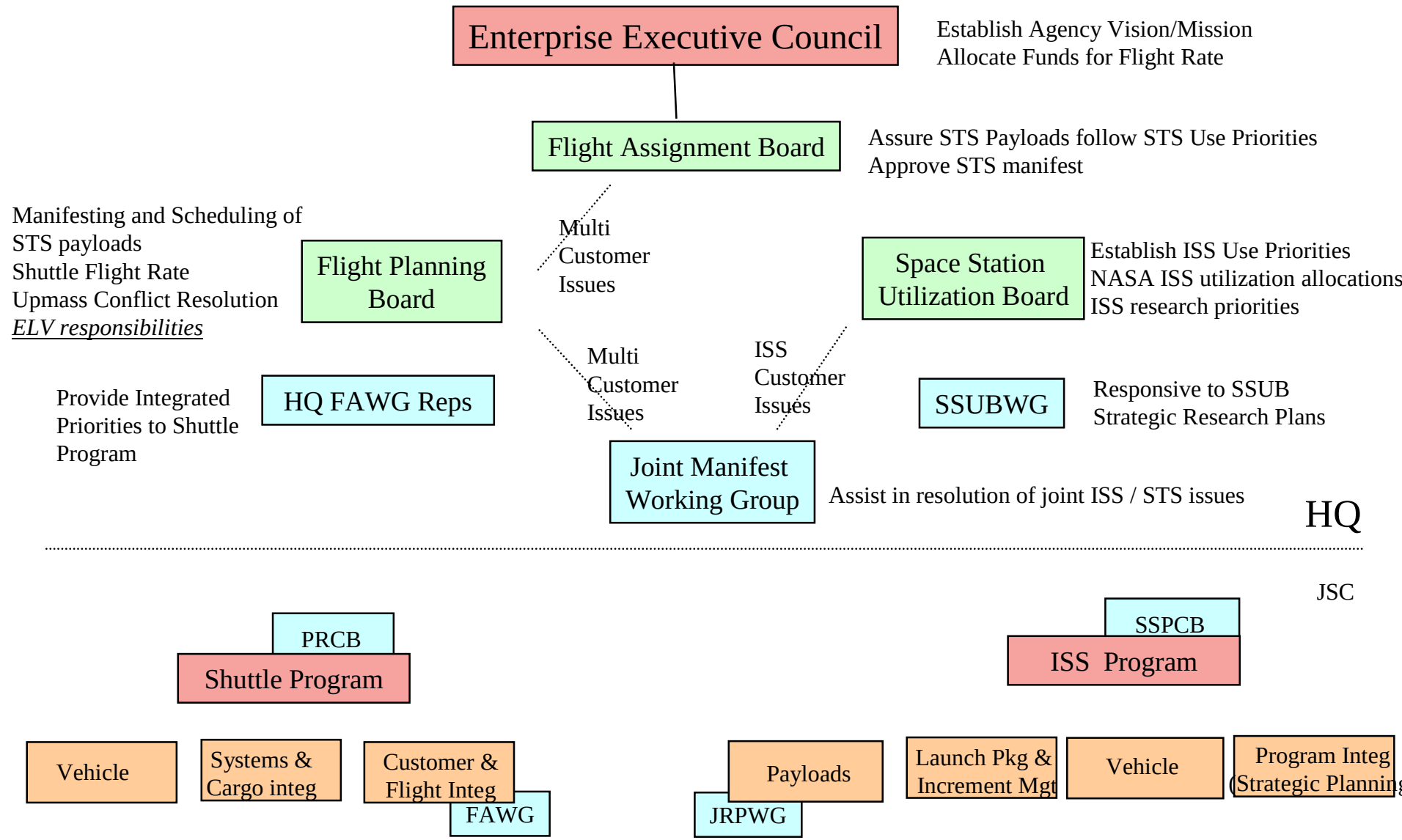
Change Strategy Description:

- Implement a single unified (One NASA) Station and Shuttle utilization process across the agency where requirements and resources are integrated through an agency level strategic plan with allocations and priorities.
  - Establish an Administrator staff level position to elevate and focus Station and Shuttle Utilization to the highest level within NASA
  - Establish a HQ Space Flight Utilization Board (SFUB) with appropriate membership (Enterprise Codes U, S, Y, M, N, R, etc..) chaired by the new position at Administrator's level
  - Establish integrated Station and Shuttle utilization priorities
- Assure that the Agency establishes an integrated set of Shuttle and Station utilization requirements
- Implement an integrated Shuttle and Station closed loop utilization allocation process
- Analyze results of allocations, priorities and set-asides assuring alignment with resources and Agency strategy and vision
- Assure that current and future infrastructure and services are aligned with these allocations and priorities
- Resolve launch priority conflicts and provide decision authority on sponsorship of flight experiments
- Provide oversight of Utilization customer entry points for the agency
- Streamline Boards, Panels, and Working groups that currently support utilization processes
- Define metrics that measure process performance, research through-put, and customer satisfaction

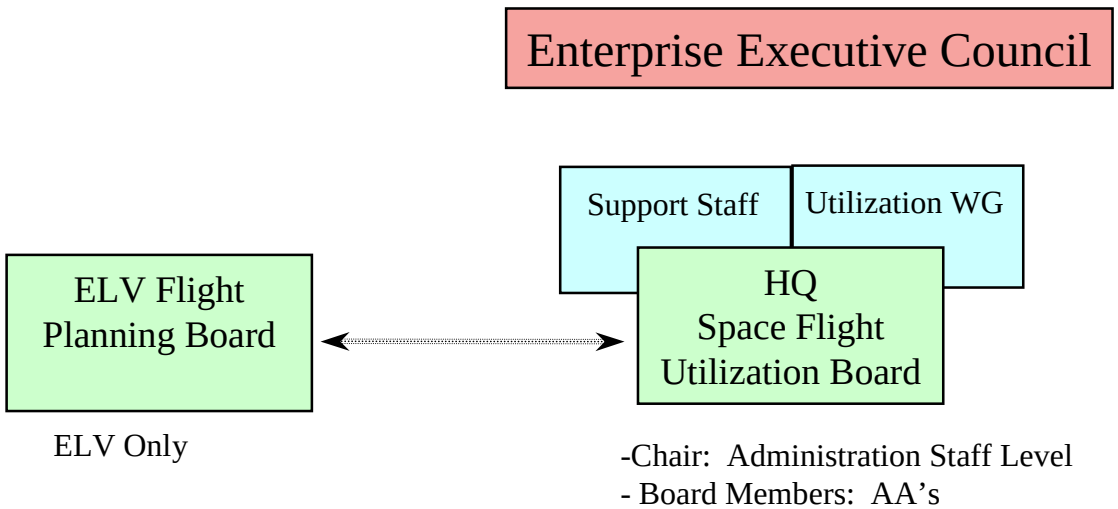
Benefits of Change Strategy:

- Enabling strategy that elevates research priority, provides utilization advocacy within the Agency at the highest level, and oversees PI's interest in the end-to-end utilization process
- Conduct oversight of the end-to-end, unified utilization process to ensure customer expectations are met and best practices are recognized and implemented across disciplines

Existing Infrastructure



Proposed Space Flight Utilization Concept

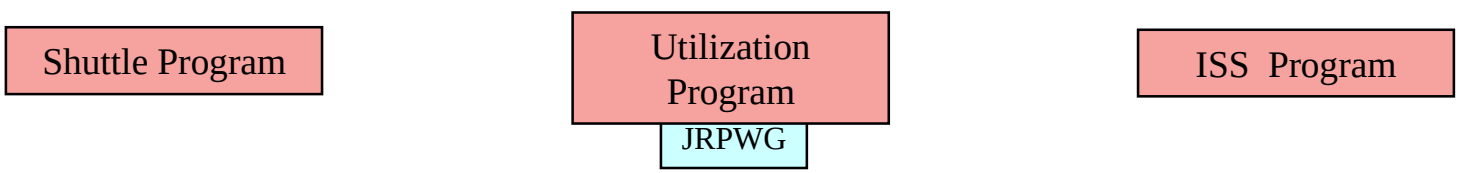


Establish Agency Vision/Mission
Allocate Funds for Flight Rate

- Assure STS Payloads follow STS Use Priorities
- Approve STS manifest
- Establish ISS Use Priorities
- NASA utilization allocations
- Utilization Strategic Plan
- Utilization research priorities
- Shuttle Flight Rate requirements
- Utilization "Front Door" for Agency
- Space Flight Utilization Process Owner
- Manifest Conflict Resolution
- Barter agreement approval
- NASA Partner Utilization Plan

HQ

JSC



Research Throughput
Change Strategy 4: Maturity of Proposals

Description of Change Strategy:

- Investigation Proposals that are solicited and selected by NASA for flight should be of sufficient maturity to allow for predictable progress to flight.
  - Typically, mature proposals are those that would allow the project to reach the end of definition phase within 1 year.
  - Proposals that have immature definition can be selected for ground based maturation if the science merits such action.
  - Selections should be made only if a realistic flight opportunity window can be identified without over-subscription of resources
- Where unique hardware needs to be developed, options within the NRA process should enable the proposer to partner with other scientists and/or a Payload Developer to facilitate mature proposals that include hardware development concept and cost estimate
- Reduce the number of peer reviews to proposal peer review only
- Establish realistic expectations early in the process.
  - Probable launch window and “process template”
  - Agreement on responsibilities and risk assumptions

Research Throughput
Change Strategy 4: Maturity of Proposals

Benefits of Change Strategy:

- Reduce time to flight
  - Less time spent in definition (typically reduced by 1 year or more)
  - Allows for more realistic determination on probable launch window early
  - Enables better planning of multiple payloads to prevent conflicts, backlog or underutilization of resources
- Involve users in process, providing more control to PI/PD
- Reduce User Workload and Cost
  - With mature proposals, a realistic set of assumptions can be made on the amount of effort necessary to complete the effort
  - Clearly set expectations on effort

Research Throughput
Change Strategy 5 : Payload Classification System

Change Strategy Description:

- Develop Agency wide research risk classification system and methodology that clearly defines categories of acceptable levels of risk for research and supporting hardware utilizing ISS and Shuttle.
  - Include definitions of risk areas, experimental design, experiment operations, documentation and performance verification, supporting hardware reliability
  - Provide guidelines for categorization of different payload classes operated as pressurized or attached payloads on Shuttle and ISS.
  - Recommended levels of acceptable risk should be based upon factors including; total cost, ISS/shuttle resource requirements, ease of reflight and criticality to agency strategic goals. This is independent of the safety evaluation process

Research Throughput
Change Strategy 5: Payload Classification System

Benefits of Change Strategy:

- Classification will allow a systematic way to do a cost-benefit analysis on payloads thus elevating research priorities and in so doing will help in setting the Agency's research priorities.

- Through the classification process PI/PD's will be brought into the process and allowed to take as much control as the classification allows in developing their hardware, software and experimental protocols.

- Cost and workload on the PI/PD will be in accordance with their classification, no more no less.

- Increased opportunities for flight may become available dependent on complexity of the payload necessary to achieve the experiment objectives. Not all experiments will be held to the same extensive verifications and testing.

- The classification system will reduce the internal experimental interfaces and complexities depending on the risk associated with the assigned classification.

- Depending on the classification and associated risk, the time spent by the PI/PD and the time to flight can be significantly reduced.

Description of Change Strategy:

- Create customized process plans and schedules according to the needs of each investigation.

Pressurized Complex Sub-Rack Template

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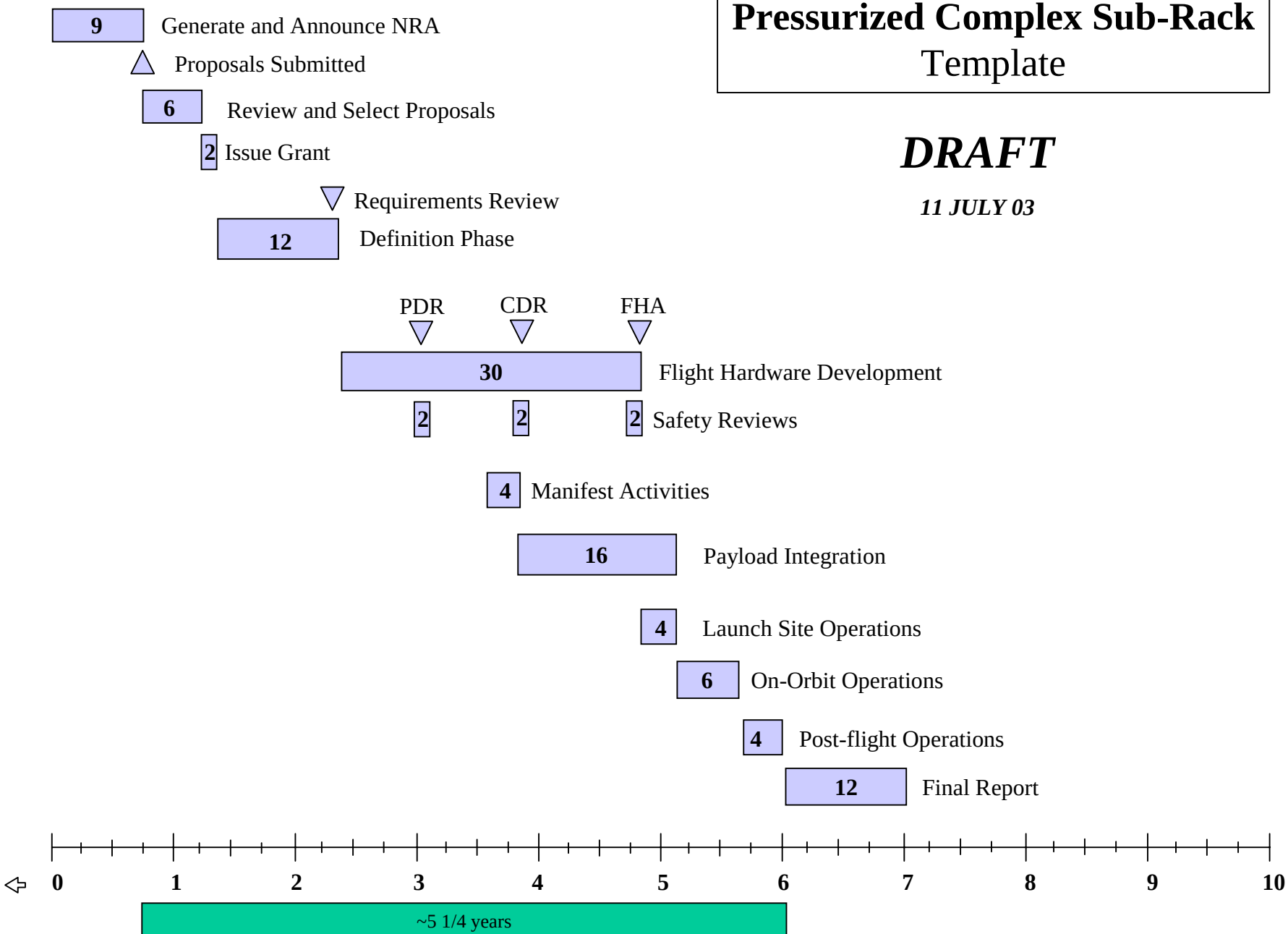
11 JULY 03



Pressurized Simple Sub-Rack Template

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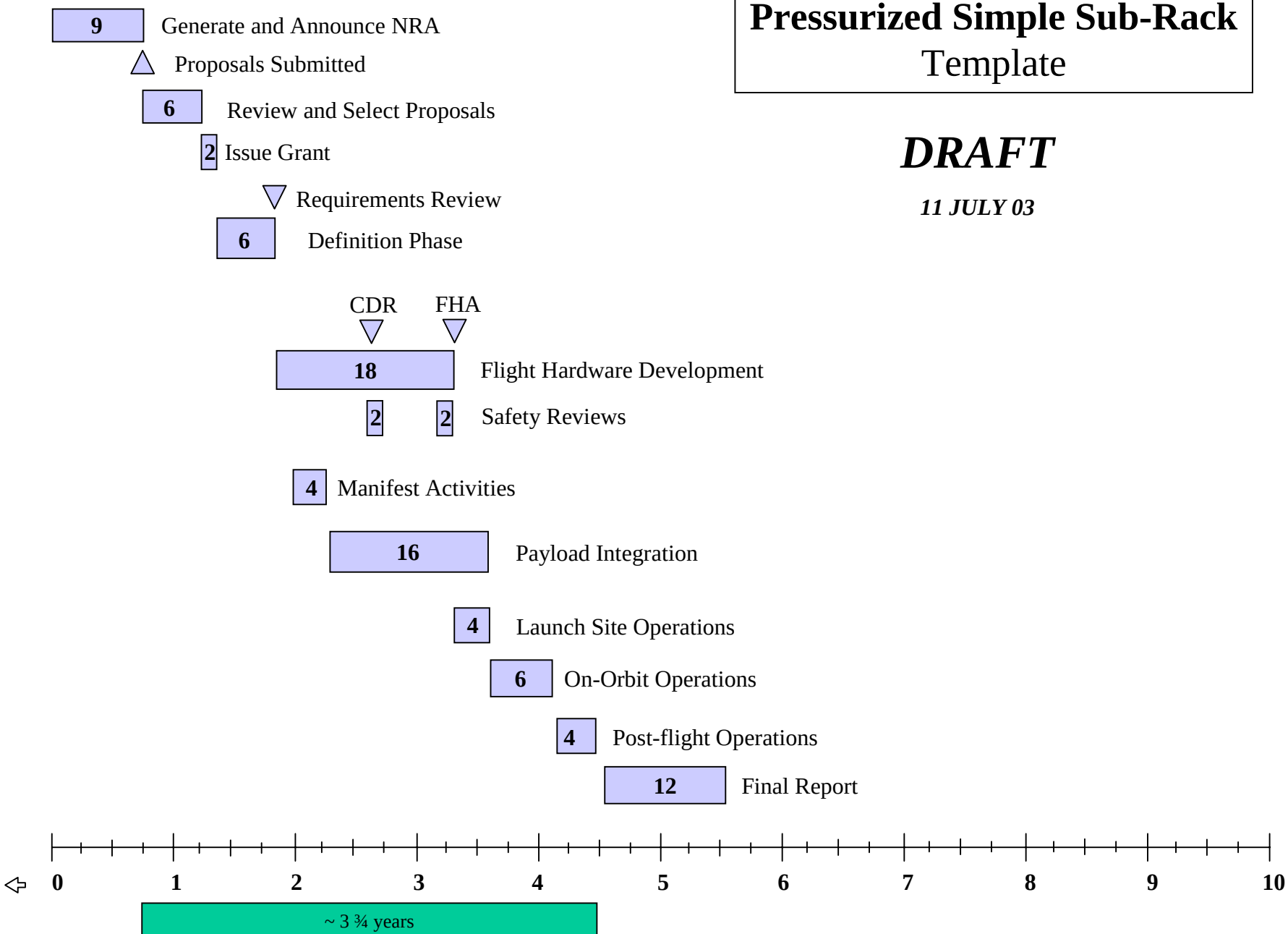

Pressurized Reflight Template
New science objectives

New science objectives; same instrument; minor modifications only

Assumes “placeholder” resources allocation during early manifesting

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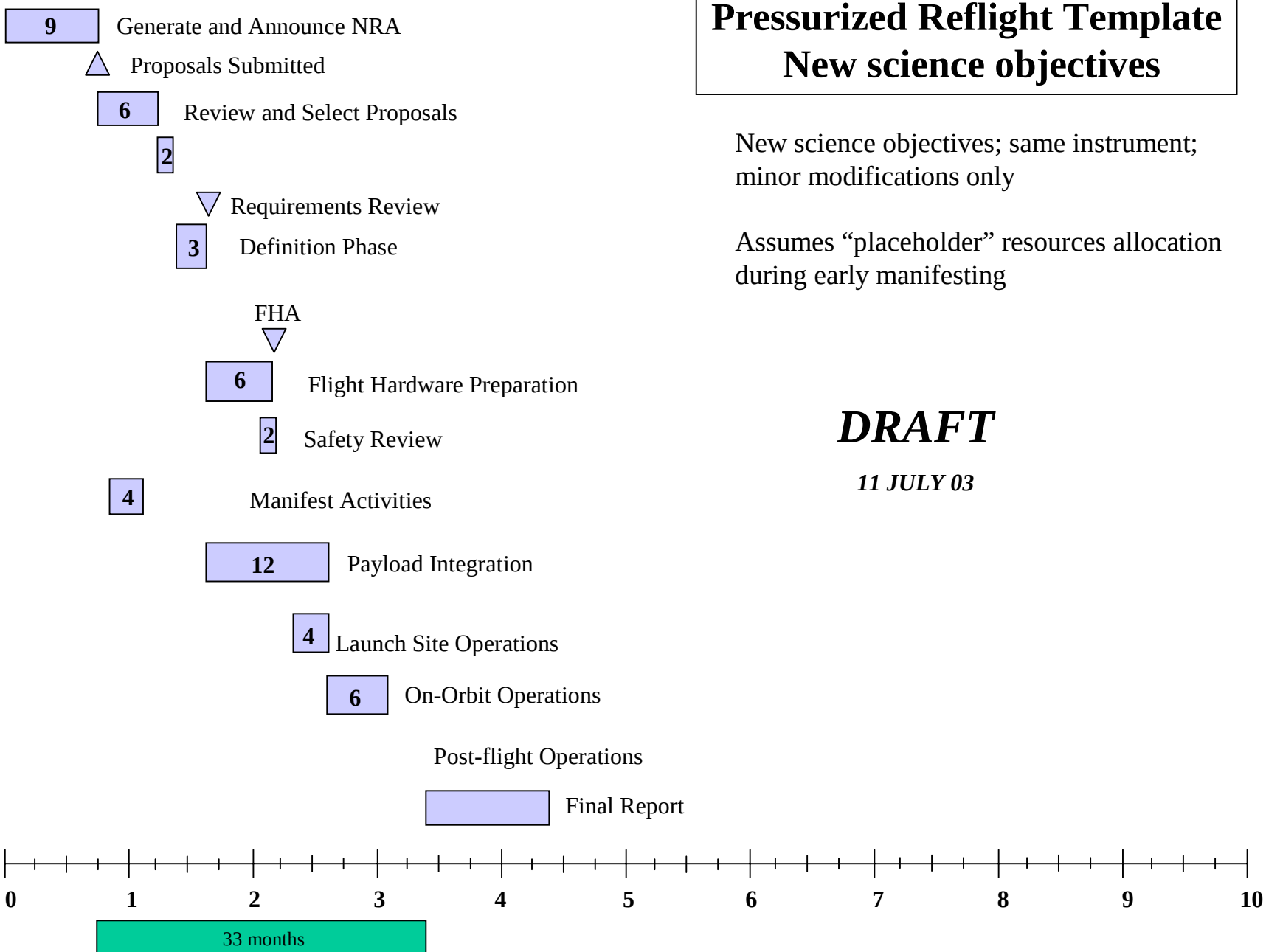

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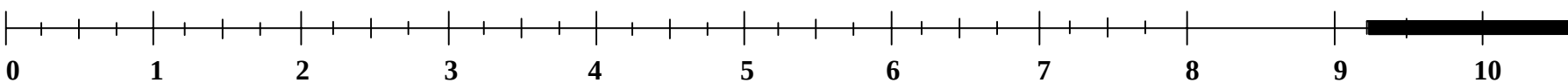

Pressurized Reflight Template
Same science objectives

Same science objectives; additional science data collection; same instrument; minor modifications only

Assumes “placeholder” resources allocation during early manifesting

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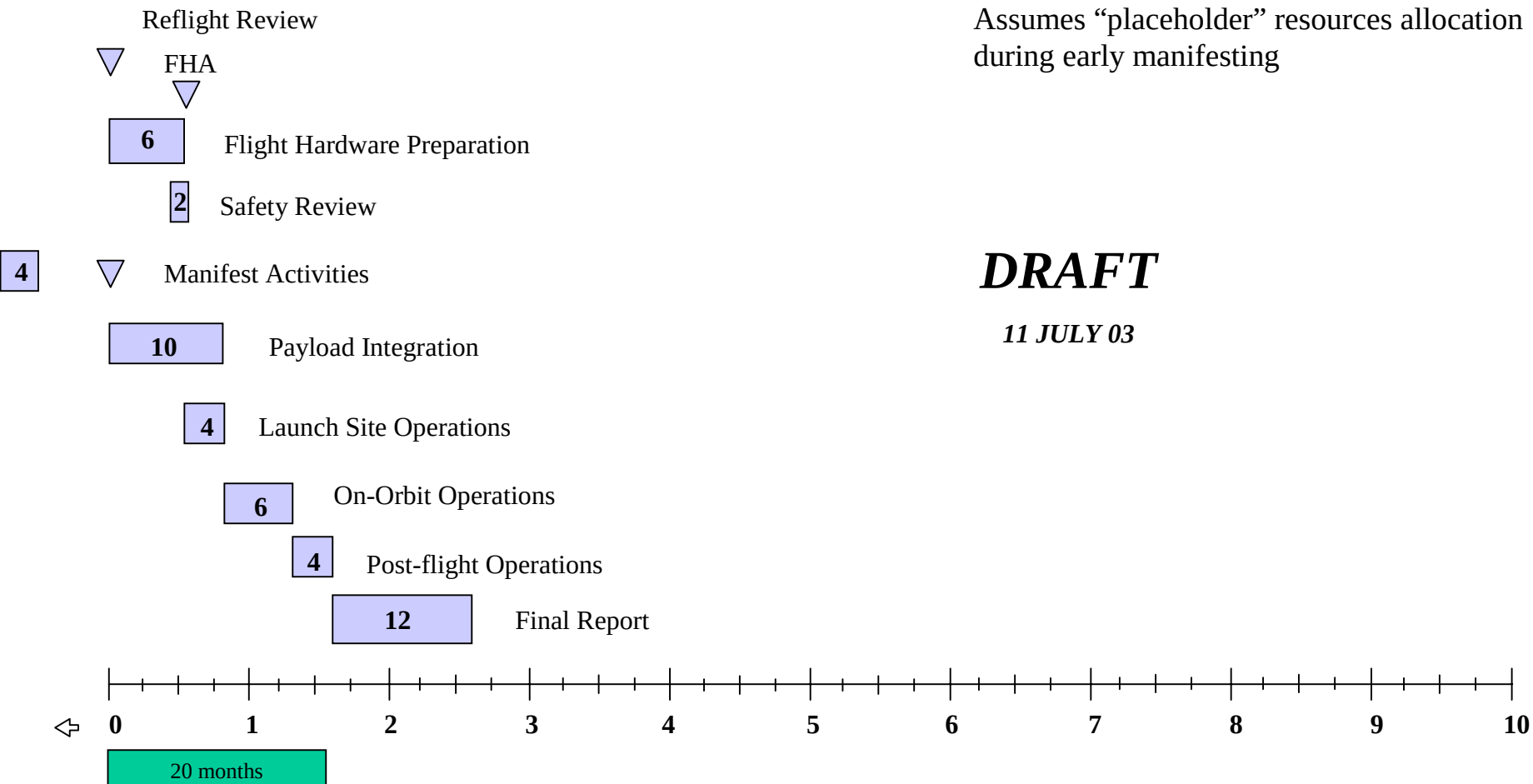


Research Throughput
Change Strategy 7: Manifest Optimization

Description of Change Strategy:

- Investigate methodologies for empowering the Principal Investigator in the manifest optimization process. This should include an assessment of a concept incorporating an end user (PI) bidding process for resources. In this concept, “rights” and “trades” are used to resolve resource conflicts through a system of bidding.
  - Upon establishment of a user complement for a particular increment and their respective priorities, allow end users to negotiate resources. Users “own” clearly defined resources and decide which resources are of greater value. Users exchange resources among themselves to enhance their respective investigations.
  - Requires “Mature Proposals” and “Timelines Tailored to Experiment” Change Strategies to be implemented and reasonably stable resources. Bidding process to begin after research prioritization.
  - A comparison of a simple ranking vs. this market-based approach would need to be assessed

Research Throughput
Change Strategy 8: Reduced Process Complexity

PART 1:

Description of Change Strategy:

- Endorse the current ISS Payloads Office process improvement activity that addresses timing of deliverables, excessive requirements in the integration phase of the cycle, and data deliverables.

Benefits of Change Strategy:

- To simplify the user interface, the ISS Payloads Office performed a comprehensive review of all requirements associated with integration on ISS and is reducing data collected by 30%
  - An additional assessment will be made of the boards and panels for consolidation to lessen impact to PD/PI
- To better communicate the integration processes and provide current status of the experiment, an information CD and web portal for data delivery/communication has been developed with tailored experiment information for each developer/PI.
  - In a follow on activity the ISS Payloads Office will incorporate standalone Shuttle payload requirements into the ISS web portal to ensure process is consistent whether an individual developer flies as a Sortie or as a long duration ISS payload
- For a consistent interface for the PD/PI, PIM service standards are being put in place.
- To involve the users in the process, a customer survey and ISS Research Hotline have been established to continuously measure satisfaction with process improvements

Research Throughput
Change Strategy 8: Reduced Process Complexity

PART 2:

Description of Change Strategy:

- Extend the process improvement to the front part of the end-to-end process (proposal selection through payload hardware development).
- Establish a team comprised of Research Integration Offices, HQ Program Executives, and a representative from the ISS Payloads Office
  - Perform an assessment of the data requirements on a Payload Developer/Payload Investigator for the upfront phases of the process.
  - Share best practices for streamlining and eliminating requirements and processes that impact the Payload Developer and Principal Investigator

Benefits of Change Strategy:

- Reduce workload and cost during definition and development phases
- Provide consistent processes between Payload Development Centers

Research Throughput
Change Strategy 9: Concurrent Payload Development and Integration

Description of the Change Strategy:

- Conduct a pilot program to determine the feasibility of using concurrent engineering to define, design, develop, and perform integration in a more parallel fashion.
  - Based on existing NASA Design Center models (e.g. JPL, GSFC)
  - Team will consist of: Principal Investigator, Payload Development Team, operations, engineering and Payload Integration Manager

Benefits of Change Strategy:

- Reduces time-to-flight by:
  - Facilitating communication during payload definition and development phases
  - Satisfying integration and development requirements concurrently

Research Throughput
Change Strategy 10: Center-to-Center Reciprocity

Description of Change Strategy:

- Develop policies and procedures (e.g. Inter-Center Agreements and Memorandums of Agreement) that allow any given NASA Center, or Research Partnership Center, to accept the analysis, technical specifications, review results and certifications of another Center
  - Example: Materials and Processes Inter-Center Agreements between MSFC and JSC

Benefits of Change Strategy:

- Reduces process complexity, cost and time-to-flight by removing the requirement to re-validate or re-verify work previously preformed by another Center

Emphasis on the Research/User Community
Change Strategy 11: Agency Research Success Philosophy

Description of Change Strategy:

- Develop a research success philosophy to be implemented across the Agency

- NASA needs to change the Agency's definition of research success to experimental results that lead to, or which truly change the way humanity lives, works and explores. NASA needs to look at research both of a fundamental and applied nature that addresses the needs, present and future, of its constituency. In addition, to high quality research, it needs to aggressively pursue cutting edge research, which will enrich the lives of the American people. This will require an agency wide understanding that failing is not only an option, but also likely if you are looking to do what no one has done before.

- It is important that the NASA workforce recognized that an experiment's success has multiple components and no single measurement is adequate. Research output, its application and data generated are all important in defining an experiment's success. This will require NASA to use the criteria the rest of the scientific community uses in their respective disciplines such as peer reviewed results and patents a measure of mission success.

Emphasis on the Research/User Community
Change Strategy 11: Agency Research Success Philosophy

Benefits of Change Strategy:

- A new success philosophy will allow the agency to benefit from accepted scientific and engineering norms of success, and in so doing promote cutting edge research. This will bring recognition to NASA and thus promote its importance to the agencies image and thus its importance overall.

- PI's will be encouraged to publish all their results, "failures" as well as successes. This will provide PI's more confidence in designing their experimental and protocols encouraging high risk, cutting edge research.

- PI's will publish or patent results as measures of success. Thus, excessive documentation on science success or loss will be eliminated.

- The PI will be able to adjust experiment objectives in order to take advantage of opportunities as long as it is patentable or publishable.

- No science success criterion is required beforehand. One just has to publish or patent the results. Thus, documentation (complexity) is simplified.

- Less time will be spent on developing science success criterion and more on maximizing experiment success. More efficient use of the PI/PD time.

Emphasis on the Research/User Community
Change Strategy 12: PI Decision Maker for Research

Description of Change Strategy:

- Build flexibility into the system for the Principal Investigator to change and mature the research ideas, objectives, and direction throughout the end-to-end process.
  - Facilitate updates and adjustments to research requirements and focus from payload selection to payload delivery to the launch site to the maximum extent available resources will allow
  - Unexpected results will occur and should be considered an opportunity for discovery. To take advantage of these on orbit opportunities NASA needs to :
    - Enable flexibility for the Principal Investigator to make changes in research direction and associated decisions regarding research based upon results to date and resources available

Emphasis on the Research/User Community
Change Strategy 12: PI Decision Maker for Research

- More PI control will bring more PI's into NASA, thus elevating NASA's image in the research community and increasing quality of research

- Since the PI will be the primary decision maker on his or her experiment they will be more involved controlling all research related questions and trade-offs. This will allow serendipity, often the mother of innovation and discovery.

- The PI/PD's will decide what effort their experiment requires and will balance results against cost/resource options.

- The PI/PD can make decisions which can impact flight opportunities such as use of crew or not and degree of training, etc.

- The classification system, together with the PI as the decision maker on his/her experiment, will help to clarify and possibly reduce experiment complexity (e.g., operational and hardware) depending on the risk associated with the assigned classification.

- Depending on the classification and associated risk, the time spent by the PI/PD will be commensurate with the experiment requirements associated with the risk they believe is appropriate.

Emphasis on the Research/User Community
Change Strategy 13: Transform Agency Culture

Description of Change Strategy:

- Transform the Agency Culture to increase focus and priority on the customer – and partner with the research/user community in accomplishing the Agency's vision for world-class space research on the ISS and Shuttle platforms.

- A major paradigm shift in Agency culture is needed to better retain and attract world-class researchers and grow U.S. advocacy for space-based research. To be successful in "implementing" this paradigm shift, increased focus and priority on the utilization research customer are needed from the top down.

Recommended actions include:

Part 1

- Strengthen the Agency, Shuttle and ISS high level plans, mission statements and values to place greater emphasis on the customer - the research/user community,

- Emphasize utilization customer satisfaction in performance plans of AA's, Center Directors, and the ISS and Shuttle Program Managers.

- Include Utilization Customer satisfaction as Agency and Center Metrics.

- Recognize Research User Community's requirements as a high priority

Emphasis on the Research/User Community
Change Strategy 13: Transform Agency Culture

Benefits of Change Strategy:

- Elevates Research Utilization to be of equal importance to the Station and Shuttle Vehicle operations and engineering.
- Reinforces the researcher as the primary customer within Human Space Flight.
- Elevates research customer satisfaction and Agency partnership with research community
- Involves users in the process and improves communications from the ISS and Shuttle programs.
- Incorporates impacts on the user in changes to processes, procedures and system design of Shuttle and ISS, providing more control.
- Focuses Shuttle/ISS processes and procedures on assisting the researcher to perform research in the complex space environment while ensuring safety is not compromised.

Emphasis on the Research/User Community
Change Strategy 13: Transform Agency Culture

Part 2

Description of Change Strategy:

- Provide significant awards and incentives, with input from the research customer, to employees who exemplify outstanding customer support (e.g., shorten process templates, develop innovative methods of conserving utilization resources, etc).
- Initiate annual Principal Investigator and Graduate Student Investigator awards for significant research achievement, notable publication, space research advocacy, etc.

Benefits of Change Strategy:

- Provides an incentive for improved customer satisfaction
- Creates a broader NASA constituency in U.S. research community (scientific, technical, commercial, educational).
- Creates a broader support throughout U.S. for value of ISS or world class research laboratory
- Recognizes the importance to the Agency of research community accomplishments and contributions.

Emphasis on the Research/User Community
Change Strategy 13: Transform Agency Culture

Part 3

Description of Change Strategy:

- Make more time available for crewmember research training and allow more time for direct interface with research team (i.e. assign crew members earlier).
- Establish crew member rotational assignments for skill-based training in Agency research areas.
- Increase and expand on-orbit opportunities for communications between PI/PD and crew
- Include non-career astronaut researchers in the flight crew.
- Create a Graduate Student Astronaut Program, similar to the Code S University Explorer program

Benefits of Change Strategy:

- Retains and attracts world-class researchers.
- Elevates research importance.
- Simplifies and improves on-orbit interfaces between the research user and the flight crew.

Emphasis on the Research/User Community
Change Strategy 14: Improve Research Advocacy

- Significantly increase available resources at NASA Headquarters and the Field Centers, incorporate marketing and other professional skills, and better utilize and train NASA's 'advocacy corps' to promote space based research. Better communicate the relevance of research on ISS and highlight significant research achievements and spin-offs throughout NASA, the research community, and the general public. Specific initiatives include:
  - Establish (or augment) an advocacy budget for Research Codes, Code M and Field Centers
  - Obtain outside expertise necessary to implement an on-going, research advocacy campaign through the mass media
  - Develop pre and post-mission presentations and other advocacy materials and centrally locate them on a server for general research community advocacy
  - Educate employees at all levels on ISS research…relevance, results and spin-offs
  - Identify key positions within the Research Codes, research community and ISS/Shuttle Programs to promote advocacy; train key advocates (crew, Principal Investigator, Chief Scientist, Program/Project Manager, etc.) and have them to disseminate the research message at appropriate venues
  - Implement plan at the Agency and Field Center level with support from NASA PAO and the Institute; take advantage of the Institute's status to complement research advocacy

Emphasis on the Research/User Community
Change Strategy 14: Improve Research Advocacy

Benefits of Change Strategy:

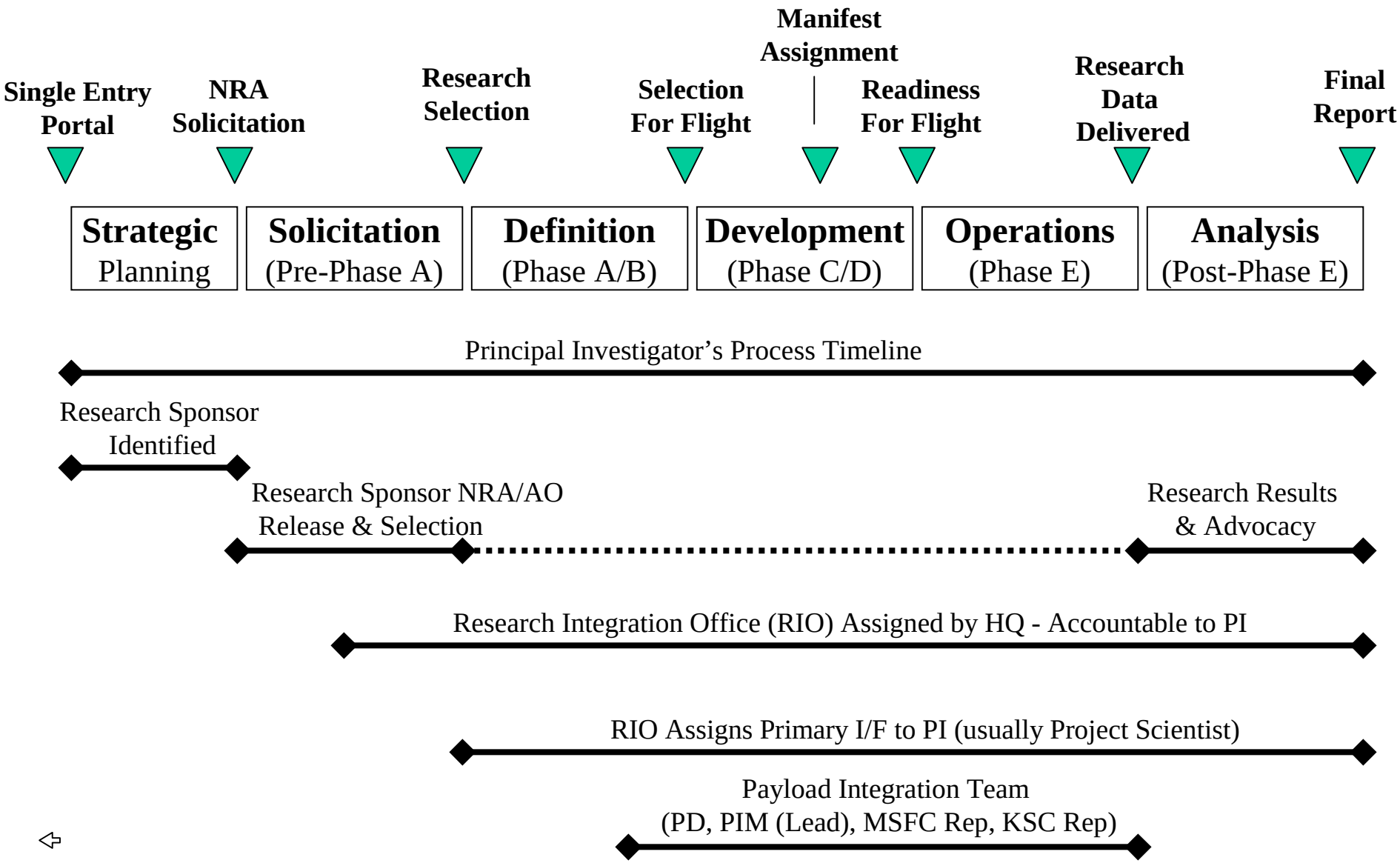
- Provides the resources and capabilities necessary to achieve advocacy - dollars, structure, skills, materials, training, etc. leading to increased opportunities for flight through increased funding.
- Elevates importance of NASA's research relevance, accomplishments and spin-offs within NASA, the research community and the general public.
- Recognizes importance to Agency of the research/user customer.
- Elevates priority of space based research with that of the launch vehicle and the enabling research platforms (ISS and Shuttle).

Emphasis on the Research/User Community
Change Strategy 15: More Customer Focused Interfaces

Change Strategy Description:

- Provide a structured Agency entry point for all potential research utilization customers regardless of platform. Entry point effort includes:
  - identifying the appropriate sponsor for the researcher from within the NASA Research Codes
  - providing an Agency-wide utilization customer help desk to facilitate customer linkage to the appropriate NASA sponsor
  - maintaining utilization customer website (capabilities, current research investigations, process for initiating research with NASA, etc.).
- Identify a specific Research Integration Office (RIO) (or equivalent) for all disciplines that will be accountable to the PI throughout the end-to-end research process for both ISS and Shuttle payloads.
  - RIO to be identified and delegated accountability from the Research Sponsor.
  - RIO to assign a primary interface (with input from the PI) for the researcher throughout the investigation's development, integration and operations. RIO also assigns a Payload Developer (PD) for the investigation.
  - RIO, in conjunction with the ISS Payloads Office to establish a dedicated (thru mission life) Payload Integration Team with representatives from each supporting NASA Center. Team membership should include the PD, JSC Payload Integration Manager (PIM), MSFC Payload Ops Representative, and KSC Launch Services Representative.

Generic ISS/Shuttle Research Investigation Development and Utilization Process Milestones



Emphasis on the Research/User Community
Change Strategy 16: More Customer Focused Interfaces

Benefits of Change Strategy:

- Simplifies interface to user by providing a clear entry point and sponsor for all solicited and unsolicited researchers who desire to conduct space based research on ISS and Shuttle.

- Provides a single entity accountable for research customer satisfaction (the RIO) and to provide a single interface for the researcher throughout the payload development, integration and operations processes

- Provides a ‘fixed’ team that supports the researcher through the end-to-end development, integration and operations activities with a focus that is ”research oriented”…a key element of success for other NASA programs (e.g. ELV, Spacelab) appears to come from being “mission oriented” with a fixed team in place throughout the process.

- Provides a customer focused, and consistent approach through development, integration and operation of a researchers investigation, thereby shielding them from the process complexities and large number of interfaces.

Emphasis on the Research/User Community
Strategy 16: Integrate Utilization at JSC

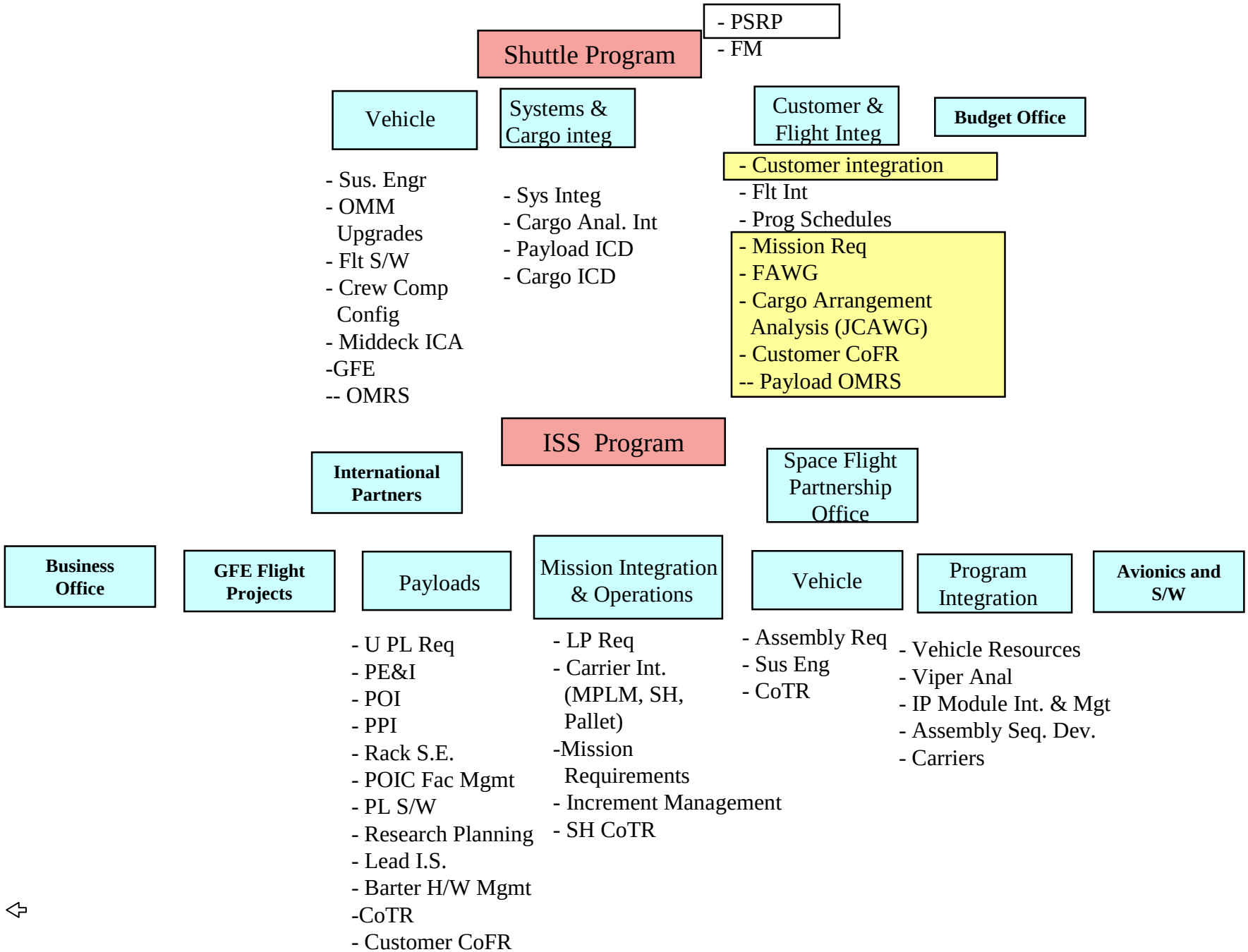
Change Strategy Description:

- Integrate Station and Shuttle utilization activities at JSC into a single Program. Establish a phased approach where utilization responsibilities are first consolidated within the Station Program with eventual transition to a single Utilization Program
- The Program would be a single interface and focus for the research/user community to both Station and Shuttle research platforms resulting in a strong research/user community advocate
- The Program would acquire services from Shuttle and Station Programs or future launch service vehicles/providers and maximize utilization capabilities across platforms

Benefits of Change Strategy

- Elevate research priority and importance to Agency. Research/Utilization would be elevated to be as important as the vehicle programs
- One consistent interface to the customer who could work to gain efficiency across processes and requirements for both platforms reducing complexity and simplifying interfaces to user
- By combining these processes you can take the best part of both processes to achieve maximum user satisfaction and efficiency
- Assure one interface to the ISS Institute and one interface to the HQ Space Flight utilization (SFU) Board for all Payload Integration activities
- Provides a single program manager who's sole focus is Utilization
- Provide more flexible flight assignment opportunities to the research community

Current STS / ISS Program Structure



Initial STS / ISS Program Structure

Shuttle Program

Vehicle

- Sus. Engr
- OMM Upgrades
- Flt S/W
- Crew Comp Config
- Middeck ICA
-GFE
-- OMRS

Systems & Cargo integ

- Sys Integ
- Cargo Anal. Int
- Payload ICD
- Cargo ICD

Flight Integration

- Flt Int
- FM
- Prog Schedules
- Launch Schedules

Budget Office

ISS Program

International Partners

- PSRP

Space Flight Partnership Office

Business Office

GFE Flight Projects

Payloads

- Customer integration
- PE&I
- POI
- PPI
- Rack S.E.
- POIC Fac Mgmt
- PL S/W
- Research Planning
- Lead I.S.
- Barter H/W Mgmt
-CoTR
- Customer CoFR
-- PL OMRS

Mission Integration & Operations

- LP Req
- Carrier Int. (MPLM, SH, Pallet)
-Mission Requirements
- Increment Management
-SH CoTR
-- Flight Assignment-Cargo
-(Tactical)

Vehicle

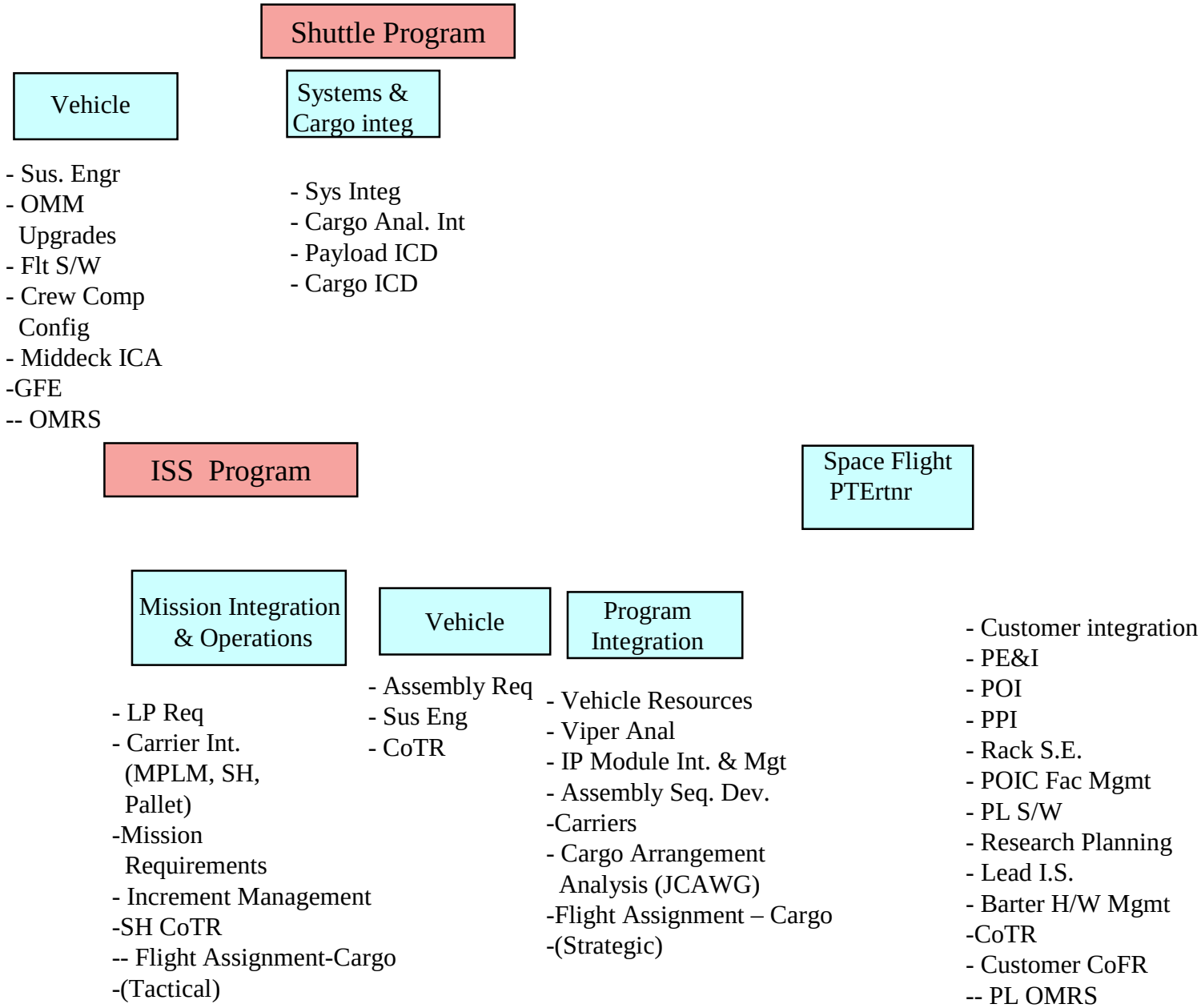
- Assembly Req
- Sus Eng
- CoTR

Program Integration

- Vehicle Resources
- Viper Anal
- IP Module Int. & Mgt
- Assembly Seq. Dev.
-Carriers
- Cargo Arrangement Analysis (JCAWG)
-Flight Assignment – Cargo
-(Strategic)

Avioics and S/W

Final STS / ISS Program Structure



Emphasis on the Research/User Community
Strategy 17:Agency Approach to Commercial Use

Description of Change Strategy:

- Integrate the Agency's approach toward partnerships with commercial organizations that use the Shuttle and Station . Provide a single HQ focus to assess and approve commercial utilization efforts that directly contribute to the Agency mission
- Relationship between sponsoring Enterprises and Research Partnership Centers (RPC) would not be changed. Enterprises will be responsible for assuring the RPC activities are aligned with the overall Agency mission

Benefits of Change Strategy:

- Reduce complexity and simplify interfaces between NASA and commercial community
- Establish the Office of Space Flight as the one HQ organization to integrate and coordinate all agency activities regarding commercial partnerships of Shuttle and Station (including flight project Space Act Agreements)
- Provide a HQ entry point for potential commercial partners and advocate for this class of users in Agency level discussions over priorities for Shuttle and Station payloads. The office would be responsible for agreements which have cross discipline aspects